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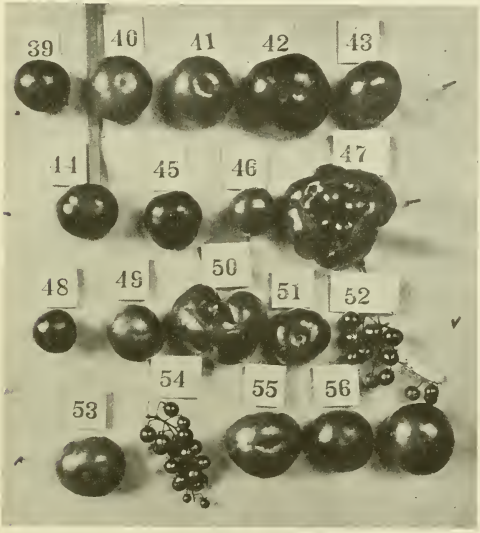
NEW HAMPSHIRE COLLEGE

AGRICULTURAL EXPERIMENT STATION

I. TOMATO GROWING IN NEW HAMPSHIRE
II. NOTES ON TOMATO BREEDING



BY F. WM. RANE AND LEIGH HUNT

NEW HAMPSHIRE COLLEGE
OF
AGRICULTURE AND THE MECHANIC ARTS
DURHAM

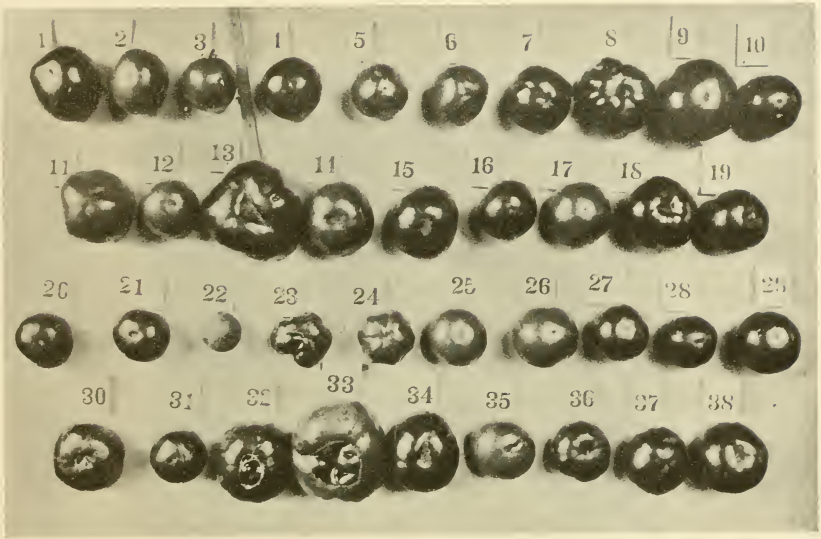


FIG. 2. Tomatoes photographed Sept. 14, 1896 (also Fig. 1, cover). See Table 1 for name.

I. TOMATO GROWING IN NEW HAMPSHIRE

F. WM. RANE AND LEIGH HUNT

At the Tilton and Rochester fairs, last fall, it was evident that tomato growing was well understood by many gardeners, especially by those who made exhibits. Many were able to name at sight a large proportion of our fifty-six varieties on exhibition. Not having fully completed our notes at that time, we were unable to state the average yield, and much of the information asked for, especially regarding the newer varieties. The office of this bulletin is to present the results of our study of the varieties named during the past season. Our deductions and notes apply only to our New Hampshire conditions. The varieties best suited to our state are those having an early maturity, ripening the bulk of their fruit before September.

SOIL AND CULTIVATION

The soil of the tomato field was a good loam, practically level. A crop of millet was grown upon the land in 1895, and potatoes in 1894. In the spring of 1896 a light coating of cow manure, and a heavy application of a complete tomato fertilizer were used. The plants which were started from seed in the greenhouse, March 16th, had been transplanted twice, once from the seed boxes into trays, two inches apart each way; and again into the cold frame, six inches apart, thus giving them a stocky growth. They were transplanted into the field May 25th and 26th, in rows five feet apart, the plants three feet apart in the row; or, at the rate of 2,904 plants to the acre. Ten plants of each variety were selected upon which to base the experiment.

The land was cultivated frequently until the plants were of fair size. The method of training was to tie each plant to an ordinary bean-pole sufficiently to keep it from the ground. This necessitated a slight amount of pruning to improve the

conditions for ripening. May and June were cool, dry months, and the tomatoes started slowly. While the remainder of the season was sufficiently wet, there was no continuous muggy weather to induce the growth of fungous diseases.

The fruit was picked three times a week, on Mondays, Wednesdays, and Fridays, and at each picking the number, total weight, amount of rot, etc., were tabulated for each variety. The photographs show a single specimen of each variety at nearly the close of the season. They were selected September 14th. While in some instances the size is slightly below the average, in most cases the selection is a fair representative of its variety.

TABLE I.

Comparison of Varieties. Ten Plants Used as the Basis of Estimation.

Number.	VARIETY NAME.	Average yield per plant.	Date of first ripe fruit.	Average weight of ripe fruit.	Per cent of rot.	Average weight of green fruit per plant, Sept. 24th.	Seedsman.
		Lbs.		*Oz.*		*Lbs.*	
1	Large Red Olive Cross	7.1	Aug. 10	2.6	3	10	Landreth.
2	Mixed Red and Purple Cross	6.4	" 12	4	1	9.8	"
3	Scarlet Cross	6	July 24	3.6	1	8.7	"
4	Large Purple Olive Cross	6	Aug. 10	5.3	4	9.6	"
5	Three Celled Cross	4.7	" 3	3.2	1	9.5	"
6	Two Celled Cross	5.2	" 10	2.6	4	13	"
7	Ten Ton	8.9	" 10	3.9	1	5.4	"
8	Early Richmond	14.2	" 7	4.9	2	3.3	"
9	Virginia Corker	8.3	" 12	2.8	2	9.8	"
10	Dwarf Aristocrat	10.9	July 24	2.8	3	4.7	Livingston.
11	Buckeye State	3.5	Aug. 19	6.8	11	8.9	"
12	Early Acme	11.2	" 3	4.2	6	5.3	"
13	Stone	8.9	" 12	7.2	.7	8	"
14	Beauty	11.2	" 7	6	4	4.5	"
15	Early Michigan	12.6	" 10	6.4	.7	6.9	Ferry.
16	Optimus	8.7	" 10	5.	1	5.4	"
17	New Tomato, No. 105	9	" 10	4.4	1	6.5	Jo'n.& Stokes
18	New Liberty Bell	10.4	" 7	6	2	3.9	"
19	The Fortune	8.1	" 7	4.5	1	2.8	"
20	Brinton's Best	11.4	" 10	5.5	2	2.7	"
21	Ignotum	8.1	July 29	3.9	4	3.2	"
22	Red Peach	3.3	Aug. 12	2	.8	5.8	Vaughan.
23	Earliest of All	9.1	July 16	2.2	2	.7	"
24	Thorburn New York	7.2	Aug. 7	3.3	15	4.6	Thorburn.
25	The Waldorf	10.1	" 7	4.8	8	6.9	"
26	Autocrat	9.6	" 10	4.8	1	6.7	"
27	Democrat	8.6	" 10	6.9	2	6	"
28	Conference	10.6	July 29	3.4	.6	3.1	Farquhar.
29	Faultless Early	8.8	" 24	4.5	3	2.7	"

TABLE I.—*Continued.*

Comparison of Varieties. Ten Plants Used as the Basis of Estimation.

Number.	VARIETY NAME.	Average yield per plant.	Date of first ripe fruit.	Average weight of ripe fruit.	Per cent. of rot.	Average weight of green fruit per plant, Sept. 24th.	Seedsman.
		Lbs.		*Oz.*		*Lbs.*	
30	Bright and Early (large)	16.3	July 24	4.8	3	.....	Farquhar.
31	President Cleveland	16.4	" 29	2.7	1	.....	"
32	Crimson Cushion	14.9	Aug. 7	7.7	3	.....	Henderson.
33	Ponderosa	18.6	" 1	7.3	4	.....	"
34	Belmont	16.6	July 24	4.2	1	.....	Breck.
35	Acme	11.9	Aug. 7	6	2	5.5	"
36	Early Leader	15.3	July 16	3	5	.2	Vick.
37	McCullom's Hybrid	11.3	" 24	4.8	4	4.6	"
38	Puritan	10.4	Aug. 12	5.7	5	7.7	Rawson.
39	County Fair	8.6	July 18	3.3	2	4.1	Buckbee.
40	Imperial	10.9	" 24	5.2	2	5.2	Burpee.
41	Fordhook First	9.7	" 8	4.2	3	8.8	"
42	Chenery's Early	10.8	" 24	4.6	6	3.8	Sch.& Fottler
43	Thorburn Long-Keeper	11.7	Aug. 4	4.2	2	5.5	"
44	Red Cross	11.2	" 7	4.6	3	2.5	"
45	Red Bird	13.9	July 29	3.9	2	.9	Cooke.
46	Fifty Days the Earliest	13.8	" 24	1.8	.3	1.7	Salzer.
47	Morning Star	12	Aug. 18	8.1	3	4.6	"
48	Bright and Early (medium)	13.8	" 18	2	.5	1.2	Dreer.
49	Bond's Early Minnesota	11.5	" 10	2.2	.7	2.4	"
50	Wisconsin Climbing	8.8	July 27	7.3	3	2.2	May.
51	First of All	13.2	" 16	4.4	2	1	"
52	Clustered Small Red	1.2	" 29	.....	2	.....	F. W. Brooke
53	Large Yellow	3.7	" 24	3.7	2	.....	"
54	Large Red (clustered)	2.5	" 29	.....	2	.....	"
55	Perfection	8.7	" 29	4.1	3	4.6	H. Barnard.
56	Dwarf Champion	3.5	Aug. 21	2.1	2	9.6	Biedermann.

NOTES ON VARIETIES

Nos. 1, 2, 3, 4, 5, and 6 are Landreth's crosses, the names of which can be found in Table I. They are of interest from the standpoint of plant-breeding, but are too unstable for general recommendation. All were comparatively late and yielded below the average.

7. *Ten Ton.*—Smooth, crimson tomato, of fair size, good shape, and moderate firmness. Ripens slowly after first coloring.

8. *Early Richmond.*—No longer deserves planting; two weeks later than other better varieties. Good size, productive, ripening rapidly after it has once turned; but is a rough, flat-

tened, much-ribbed fruit. Its irregularities make it likely to be broken in handling.

9. *Virginia Corker.*—Rather late and ripens slowly; of good form and color; firm. Good for close of season and green fruit.

10. *Dwarf Aristocrat.*—Bright red fruit, which began to ripen early but not in quantity until late. Fruit solid, round or apple-shaped, small to medium; vines two to three feet high, of a very dark green, massive foliage.

11. *Buckeye State.*—Except for a very late fruit, this is useless. Large vines and fruit of good size and form, and crimson-purple in color. Bad tendency to rot.

12. *Early Acme.*—Probably a selected strain from the older Acme. Though similar in all respects, it is rather inferior. Ripening earlier in the season, it also ripens more slowly; nothing gained. Good size and shape, prolific.

13. *The Stone.*—An excellent tomato in form, color, quantity, and size, good keeper, solid, skin strong, scarlet; ripens regularly throughout the season. Late and strong grower.

14. *Livingston's Beauty.*—One of the most satisfactory tomatoes grown; medium early, continuing very late. Crimson or purple fruit, of a very smooth, solid, and desirable form. Keeps and ships well; good quality, vines strong growers of medium size. Prolific.

15. *Early Michigan.*—Not to be called an *early* tomato; others had yielded fifteen or sixteen pounds of fruit before this ripened. Smooth, good shape, rather large, prolific.

16. *Optimus.*—Very uniform in color, size, and form; a good, productive, middle-season tomato.

17. *New Tomato, No. 105.*—Large, late vines, with fruit of good size, fairly abundant, firm, smooth, red. Keeps well.

18. *New Liberty Bell.*—Medium to late, fair size, round and somewhat flattened; tendency to remain green and to crack at stem end.

19. *New Fortune.*—Smooth, uniform in size and shape, good quality, with vines of a rugged, strong growth.

20. *Brinton's Best.*—Middle-season variety, smooth, red, fair size, good quality.

21. *Ignotum.*—Large, smooth, solid, sour, productive, and well-known variety; tendency to rot.

22. *Red Peach.*—Good for its kind,—useful only for private gardens.

23. *Earliest of All.*—Slender vines, bearing a good crop of a most inferior, rough, ribbed fruit, with one side ripe and one green. Ripens in quantity early in season, which is all that can be said for it.

24. *Thorburn's New Yorker.*—A medium tomato in all respects; hexagonal in shape, red and purple, considerable rot at blossom end. Tendency to crack before ripe.

25. *The Waldorf.*—Very good; medium to late, smooth, productive, and firm; desirable shape and size.

26. *Autocrat.*—Fair, not as uniform in size as Beauty, Champion, etc., but of good average, desirable firmness and shape, mild flavor, prolific.

27. *Democrat.*—Larger and not as smooth as 26, but much like it.

28. *Conference.*—Smooth, medium size, good quality, firm and productive.

29. *Faultless Early.*—A good, smooth tomato, uniform in size, color, and shape; not particularly early, but preferable to 23.

30. *Bright and Early.*—Large and irregular; does not ripen uniformly. Of no use.

31. *President Cleveland.*—Not uniform in size, color, or shape; good quality, fairly firm, prolific.

32. *Crimson Cushion.*—Uniformly large, irregular, quite badly cracked and spotted with green; productive.

33. *Ponderosa.*—Ripens slowly; huge, irregular, double and single fruits; not suitable for table use.

34. *Belmont.*—Scarlet, round, smooth, solid, early, very productive, and of good quality; ripens very uniformly throughout the season.

35. *Acme.*—A dark red, medium-sized, smooth, solid, and well-known, reliable variety.

36. *Early Leader.*—Very similar to 23, very little better; of no use.

37. *McCullom's Hybrid.*—No uniformity in vines, color, shape, or quality of fruit; productive.

38. *Puritan.*—Scarlet, medium to late, good size and form; variable.

39. *County Fair.*—One of best grown; early, productive, fruit solid, dark red, smooth, good quality, ripening plentifully throughout the season. Sturdy, dark green vines, similar to Dwarf Aristocrat.

40. *Imperial.*—Not up to standard this season; not of usual size. Some cracked; seed mixed, perhaps.

41. *Fordhook's First.*—Tall growing vines, yet one of earliest to produce good fruit. Crimson, round, and smooth, solid, good flavor; keeps well. One of very best early sorts; continues good till frost.

42. *Chenery's Early.*—A good crimson variety, but not equal to 41. Fruit fairly solid, of uniform shape.

43. *Thorburn Long-Keeper.*—Good size, firm, fair quality, good keeper, productive.

44. *Red Cross.*—Medium size, middle and late season, firm, good shape and quality.

45. *Red Bird.*—Medium to small, good quality and form, not very solid; productive.

46. *Fifty Days the Earliest.*—A red tomato of small size, solid, round, smooth, and uniform in all respects; medium early and productive. Good for shipping, if size be permissible.

47. *Morning Star.*—Another of the Ponderosa type; equally large, rough, and undesirable.

48. *Bright and Early.*—Very similar to 46 and 49, but later.

49. *Bond's Early Minnesota.*—Dark red, small, plump, hard, and of good quality, productive; not early. Same class as 46 and 48.

50. *Wisconsin Climbing.*—Large, double tomatoes, rough and undesirable.

51. *First of All.*—Fairly smooth, with tendency to crack at top as season advances. Probably identical with Atlantic Prize.

52. *Clustered Small-Red.*—Curiosities; inferior in flavor, late, and apt to crack before ripening.

53. *Large Yellow.*—Medium size, smooth, good quality, but ripens very slowly, with light yields. Inferior to Lemon Blush or Golden Queen.

54. *Large Red Clustered.*—Same as 52, only somewhat mixed with yellow.

55. *Livingston Perfection.*—Early, of good size, uniform in color and shape; one of best for home gardens. Softer than Beauty.

56. *Dwarf Champion.*—Short, stocky vines, yielding good crops of smooth, purple, solid fruit; stands shipping well. Desirable for any purpose; are the very best for spring plant trade.

SUMMARY

1. The varieties best suited to New Hampshire are those having an early maturity, ripening the bulk of their fruit by September.

2. The following varieties we would place upon the rejected list: Early Richmond, Earliest of All, Bright and Early, Ponderosa, Early Leader, Morning Star, Wisconsin Climbing, and Large Yellow.

3. All of the Landreth crosses, together with Buckeye State and Virginia Corker, are too late for this climate.

4. The varieties making the best general showing were: Belmont, Early Michigan, Acme, Brinton's Best, Beauty, Red Cross, Waldorf, Fordhook's First, Stone, and County Fair. These are named in order of productiveness.

5. The varieties making a fair showing were: Red Bird, Long-Keeper, Dwarf Aristocrat, Chenery's Early, Conference, Puritan, Autocrat, No. 105, Optimus, Perfection, Ignotum, Fortune, and Dwarf Champion. Also given in order of productiveness.

6. The following varieties were found to possess some objectionable features: President Cleveland, Crimson Cushion, First of All, McCullom's Hybrid, Imperial, New Liberty Bell, Faultless Early, and New York.

7. A distinct type of tomato is found in the three varieties: Bright and Early, Fifty Days the Earliest, and Bond's Early

Minnesota. While below the average in size, as shown is Nos. 48, 46, and 49, respectively, in the photograph, they are smooth, uniform, productive, and very desirable for home use, if not for the market.

8. Varieties 22, Red Peach, 52, Clustered Small Red, and 54, Clustered Large Red, are simply novelties, and of comparatively little use except for preserving and pickling.

II. NOTES ON TOMATO BREEDING

BY F. WM. RANE

There is probably no plant we have so much literature upon, and that has been studied so thoroughly from the standpoint of plant-breeding, as the tomato. This is doubtless due to the fact that it is easily grown, commonly used, and offers exceptionally good opportunity for study.

The tomato plant is quickly susceptible to careful selection, and it is by this that value is given to cross results, whether natural or mechanical.

In selecting tomato seed it has been demonstrated that the plant as a whole has more hereditary influence than the character of the individual fruit.

Repeated experiments have shown that nothing is gained by selecting seeds from first ripe fruit, regardless of the character of the plant from which they come.

When new varieties are desired through crossing, the foregoing applies equally to each parent. The more uniform and persistent the parent, the greater is the chance that its characteristics will be transmitted.

When the desired variety is once realized, it is kept only by constant attention to selection. It is doubtless chiefly due to

carelessness in selection that our varieties of tomatoes as a whole are so comparatively short-lived.

Tillage, fertilization, and other treatment of plants have their effect upon tomato breeding. Poor soils and insufficient cultivation tend to revert the variety.

Keeping quality evidently has not been generally taken into consideration, up to the present time, in breeding the tomato. Experiments at the Cornell, New York, station go to show that solid varieties may not be the best keepers.

Hybridizing between the larger varieties and the clustered, or currant tomatoes, generally results in producing fruit intermediate in size.

Crosses between the large or potato-leafed and common-leafed varieties usually result in an intermediate foliage.

The red varieties seem to have the power to stamp their color on the offspring of crosses with other colors.

Varieties of tomatoes mix very readily when grown in the same field. Pure seed should be selected from isolated varieties.

The tomato, as with other crops, needs a rotation. The plants grown on the same land from year to year, although highly fertilized, naturally degenerate in time.

In order to secure results from crossing the tomato, one cannot be too well acquainted with the parent varieties, nor have too clearly defined plans of procedure. Haphazard crossing is of little value.

When the parents are very different in character, the chances are that the offspring will be weak, while the offspring of closely related species or races is likely to be very vigorous.

ORIGIN OF TOMATOES

The evolution of our cultivated tomatoes is interesting. The two species from which all our garden varieties have originated are *Lycopersicum pimpinellifolium* and *Lycopersicum esculentum*. The former includes the "Currant" varieties, which are small and borne in large clusters, sometimes spoken of as the "Raisin" tomatoes. This species is a South American variety, and is found growing wild in both Brazil and Peru. Although known for some time, comparatively little use has been made of them, except for pickles, preserves, and for ornamentation.

L. esculentum is the species from which our commercial tomatoes come. It is thought also to have originated in Peru, although it has been found in other countries, as in Mexico and California, in a form similar to the cherry tomato.

HISTORY OF GROWTH

While the tomato was known in Europe as far back as 1561, but four varieties were found in England in 1819. In these early days it was grown mainly for ornament. Prof. Munson finds that the fruit was first introduced into this country at Philadelphia by a French refugee from St. Domingo, in 1798; and again by an Italian painter, Comé, at Salem, Mass., about 1802. The beginning of general culture of the tomato for market is placed at about 1830. From this time up to the present, the evolution of the tomato has been steady. From the flat, rough, and angular tomatoes, beautiful, round, regular fruits have been developed. The Paragon variety was the first to be so developed. Since then other superior varieties have come and gone. One would think further improvement almost an impossibility, but doubtless the advancement of the next ten years will be as great, if not greater, than that of the last decade.

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